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Chief, Operations, OC

22 December 1952

Chief, Engineering Division, OC

Small Broadcast Receiver for Activation purposes

REF : (a) [redacted] 25X1

(b) OC-0 Memo, NCE2-2048, dated 17 November 1952

1. Reference (a) discusses the requirements for a small activation receiver and forwarded a model of a [redacted] short wave broadcast set. 25X1 Reference (b) forwarded the receiver to the R & D Branch with a request for its Technical evaluation.

2. Transmitted herewith are two copies of the report concerning an Analysis and Appraisal of the [redacted] Receiver per your request of Ref (b). 25X1

FOR THE CHIEF, ENGINEERING DIVISION

[redacted] 25X1

OC/ENG/

OC/R&D/WWB/kgs (22 December 1952)

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Reading
Dev/s
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AN ANALYSIS AND APPRAISAL OF THE [redacted] ACTIVATION RECEIVER

25X1

16 December 1952

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INTRODUCTION

A sample "activation" type receiver, manufactured [redacted] was submitted to the R & D Branch of Commo Engineering for analysis and appraisal. The following tests were conducted to determine its pertinent electrical characteristics. 25X1

SUMMARY

The [redacted] activation receiver is battery-powered and tunes from 3.6 to 24.0 megacycles in two bands. It is compact and light-weight, measuring 3 x 11 1/2 x 5 1/4 inches and weighing 5 pounds. A beat-frequency oscillator has been incorporated for the reception of C.W. signals in addition to normal A.M. reception. The user has a choice of listening to the loud-speaker or plugging in a hearing-aid type earset. A momentary-contact switch controls dial illumination resulting in battery current conservation. 25X1

1. Electrical Tests

1.1. Sensitivity

f (mcs)	Band	Raw Noise (mw)		10db s/n Sensitivity (μv)		Raw Sensitivity (μv)	
		CW	AM	CW	AM	CW	AM
4.0	1	1.7	.00032	17.0	54	9.0	108
7.0	1	1.2	.00024	4.0	15	2.6	28
10.0	1	0.6	.00008	9.5	22	7.0	68
12.0	2	1.8	.00042	21.0	80	13.0	140
17.0	2	1.5	.00028	9.5	28	5.2	53
22.0	2	1.6	.00032	20.0	75	11.0	130

Test Conditions

Standard output - 5.0 mw., 600 ohm load
Amplitude modulation - 30%, 400 cps
Raw Noise, AM - Noise power output, no signal
Raw Noise, CW - Noise power output, no signal, BFO on

$$\text{10db s/n, AM} = 10 \lg_{10} \frac{(\text{Audio output, sign.} + \text{mod.} + \text{noise})}{(\text{Audio output, sign.} + \text{noise})}$$

$$\text{10db s/n, CW} = 10 \lg_{10} \frac{(\text{Audio output, sig.} + \text{noise})}{(\text{Audio output, noise})}$$

Raw Sensitivity - Signal + noise for 5.0 mw. output

1.2. Image Rejection

f (mcs)	Rejection (db)
4.0	20.7
7.0	19.2
10.0	8.5
12.0	17.3
17.0	14.4
22.0	-2.1

Test Conditions:

R.F. Signal - Modulated 30% @ 400 cps
Standard output-5.0 mw., 600 ohm load
Rejection (db)- $20 \lg_{10} \frac{\text{(Microvolt input at (I.F.)(Image)freq.)}}{\text{(Microvolt input at test frequency)}}$

1.3. I.F. Rejection

f (mcs)	Rejection (db)
4.0	48
7.0	57
10.0	74
12.0	57
17.0	66
22.0	60

Test Conditions - Same as for Image Rejection

1.4. Overall Selectivity

Response (db)	Bandwidth (kc)
0	0
10	8.0
30	18.5
50	33.3
70	58.3

Test Conditions:

R. F. Signal - Modulated 30% @ 400 cps
Standard output - 5.0 mw., 600 ohm load
Receiver gain - maximum

Method of test:

(1) The signal generator is set to center frequency and its output increased until receiver power is 5.0 mw.

(2) The signal generator output is increased the specified number of decibels and is shifted from center frequency until the receiver output is again 5.0 mw.

(3) Bandwidth is measured with a secondary frequency standard.

1.5. Calibration Accuracy

f (mcs)	Error (%)
4.0	0.35
6.0	0.67
8.0	0.11
10.0	0.15
13.0	0.37
16.0	0.04
19.0	0.38

Test Conditions:

BC-221 used as a secondary frequency standard.

1.6. Receiver Stability

1.6.1 Overall frequency shift as a function of warm-up time. (see curve #1)

1.6.2. Overall frequency shift as a function of B voltage decrease. (see curve #2)

1.7. Power Requirements

293 ma. at 1.4 volts
14.6 ma at 90 volts } BFO on, using speaker or earpiece

1.8. Expected Battery Life

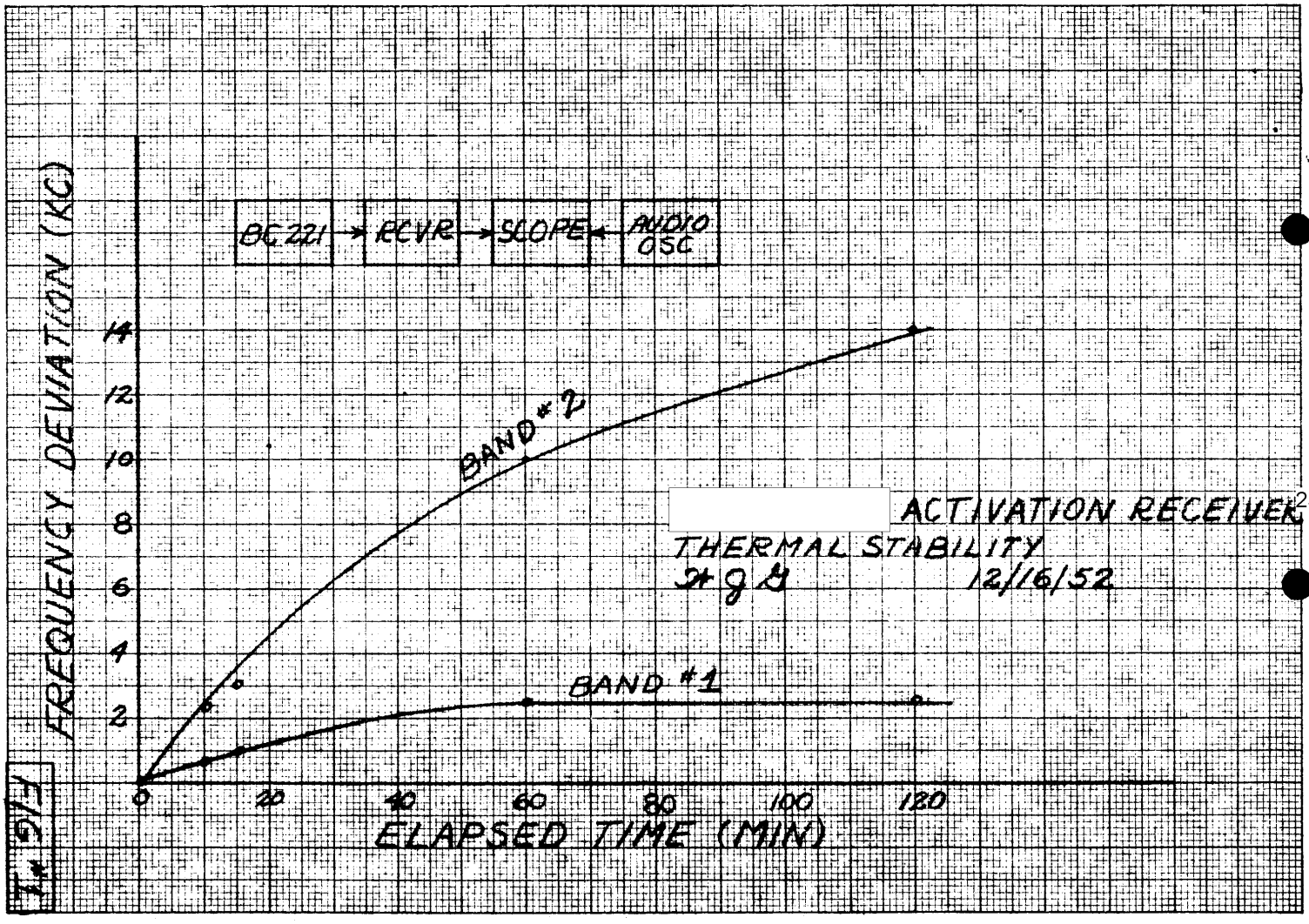
Four hours/day operation:

4TA60 - 75 days
6TA60 - 105 days

CONCLUSION

This receiver, like most AM-CW sets, is more sensitive to CW signals. Its selectivity, I.F. rejection, and calibration accuracy are adequate for its prospective employment.

Re-alignment of the low frequency band improved the CW sensitivity from 17.0 and 9.5 microvolts to 7.0 and 5.5 microvolts at the low and high end respectively. It is felt that if the phasing operation during production were more accurate, the improved sensitivity and image rejection would render the set completely satisfactory.



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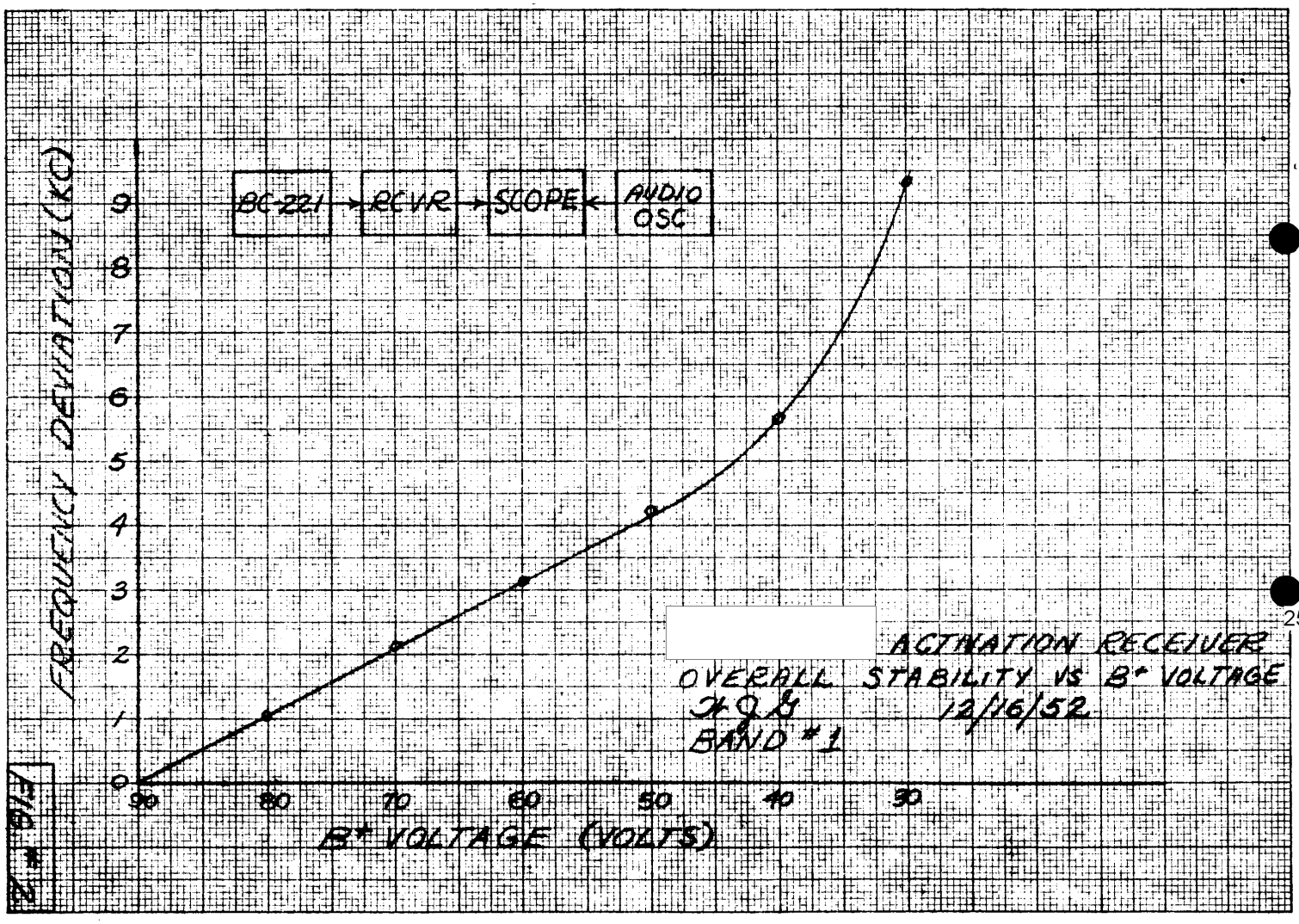

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ACTIVATION RECEIVER